Attachment E to the Resolution 12-29

Staff's Suggested Modifications to the Original Proposal
(Distributed at the August 23, 2012 Board hearing)

Amend section 1971.1, title 13, California Code of Regulations, to read as follows:

Note: The amendments proposed with the 45-day notice are shown in single underline to indicate additions and ~~single strikeout~~ to indicate deletions from the existing regulatory text, while new amendments proposed with these staff suggested modifications are shown in double underline to indicate additions and ~~double strikeout~~ to indicate deletions from the existing regulatory text. Various portions of the regulations that are not modified by the proposed amendments are omitted from the text shown and indicated by " * * * * ".

§1971.1. On-Board Diagnostic System Requirements--2010 and Subsequent Model-Year Heavy-Duty Engines

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(e) *Monitoring Requirements for Diesel/Compression-Ignition Engines.*

(1) Fuel System Monitoring

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(1.4) MIL Illumination and Fault Code Storage:

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(1.4.2) Additionally, for malfunctions identified in section (e)(1.2.1) (i.e., fuel pressure control) on all 2013 and subsequent model year ~~vehicles~~ engines:

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(D) Storage of freeze frame conditions.

(i) For 2013 through 2015 model year engines, a~~A~~ manufacturer shall store and erase freeze frame conditions either in conjunction with storing and erasing a pending fault code or in conjunction with storing and erasing a confirmed/MIL-on fault code. For 2016 and subsequent model year engines, a manufacturer shall store freeze frame conditions in conjunction with storing and erasing a pending fault code in accordance with section (d)(2.2.1)(D)(iii) or (d)(2.2.2)(D).

(ii) If freeze frame conditions are stored for a malfunction other than misfire (see section (e)(2)) or fuel system malfunction when a fault code is stored as specified in section (e)(1.4.2) above, the stored freeze frame information shall be replaced with freeze frame information regarding the fuel system malfunction.

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(2) Misfire Monitoring

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(2.3) Monitoring Conditions:

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(2.3.3) ~~Additionally, f~~For misfires identified in section (e)(2.2.2) ~~2013 and subsequent model year engines equipped with sensors that can detect combustion or combustion quality~~:

(A) The OBD system shall continuously monitor for misfire under the following conditions:

(i) For 2013 through 2018 model year engines and 2019 and subsequent model year engines that are not included in the phase-in specified in section (e)(2.3.3)(A)(ii), ~~all~~ under positive torque conditions between 20 percent and 75 percent of peak torque with engine speed~~s~~ up to 75 percent of the maximum-rated engine speed ~~and engine load up to 75 percent maximum-rated~~ and ~~load~~ conditions ~~except within the following range.: the engine operating region bound by the positive torque line (i.e., engine load with transmission in neutral) and the two following engine-operating points: engine speed of 50 percent of maximum-rated engine speed with the engine load at the positive torque line, and 75 percent of the maximum-rated engine speed with the engine load 5 percent above the positive torque line~~.

(ii) For 20 percent of 2019 model year diesel engines, 50 percent of 2020 model year diesel engines, and 100 percent of 2021 model year diesel engines (percentage based on the manufacturer's projected California sales volume of all diesel engines subject to this regulation), under all positive torque engine speed and load conditions except within the following range: the engine operating region bound by the positive torque line (i.e., engine load with transmission in neutral) and the two following engine-operating points: engine speed of 50 percent of maximum-rated engine speed with the engine torque at the positive torque line, and 100 percent of the maximum-rated engine speed with the engine torque 10 percent above the positive torque line.

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(C) A manufacturer may request Executive Officer approval to disable misfire monitoring or employ an alternate malfunction criterion when misfire cannot be distinguished from other effects.

(i) Upon determining that the manufacturer has presented documentation that demonstrates the disablement interval or period of use of an alternate malfunction criterion is limited only to that necessary for avoiding false detection, the Executive Officer shall approve the disablement or use of the alternate malfunction criterion for conditions involving:

a. rough road,

b. fuel cut,

c. gear changes for manual transmission vehicles,

d. traction control or other vehicle stability control activation such as anti-lock braking or other engine torque modifications to enhance vehicle stability,
e. off-board control or intrusive activation of vehicle components or diagnostics during service or assembly plant testing,
f. intrusive diagnostics during portions that can significantly affect engine stability, or
g. infrequent regeneration events during portions that can significantly affect engine stability.

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(2.4) MIL Illumination and Fault Code Storage:

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(2.4.2) Additionally, for ~~2013 and subsequent model year engines~~ misfires identified in section (e)(2.2.2)~~equipped with sensors that can detect combustion or combustion quality~~:

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(B) Storage of freeze frame conditions.

(i) For 2013 through 2015 model year engines, t~~T~~he OBD system shall store and erase freeze frame conditions either in conjunction with storing and erasing a pending fault code or in conjunction with storing a confirmed/MIL-on fault code and erasing a confirmed/previously MIL-on fault code. For 2016 and subsequent model year engines, a manufacturer shall store freeze frame conditions in conjunction with storing and erasing a pending fault code in accordance with section (d)(2.2.1)(D)(iii) or (d)(2.2.2)(D).

(ii) If freeze frame conditions are stored for a malfunction other than a misfire malfunction when a fault code is stored as specified in section (e)(2.4.2), the stored freeze frame information shall be replaced with freeze frame information regarding the misfire malfunction.

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(5) Non-Methane Hydrocarbon (NMHC) Converting Catalyst Monitoring

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(5.2) Malfunction Criteria:

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(5.2.3) Other Aftertreatment Assistance Functions:

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(B) For ~~2013~~ 2015 and subsequent model year engines, for catalysts used to generate a feedgas constituency to assist SCR systems (e.g., to increase NO_2 concentration upstream of an SCR system), the OBD system shall detect a malfunction when the catalyst is unable to generate the necessary feedgas constituents for proper SCR system operation. Catalysts are exempt from ~~feedgas generation~~ this monitoring if both of the following criteria are satisfied: (1) no malfunction of the catalyst's feedgas generation ability can cause emissions to ~~(1)~~ increase by 15

percent or more of the applicable ~~full useful life~~ standard as measured from an applicable emission test cycle; ~~or~~ and (2) no malfunction of the catalyst's feedgas generation ability can cause emissions to exceed the applicable ~~full useful life~~ standard as measured from an applicable emission test cycle.

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(8) Particulate Matter (PM) Filter Monitoring

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(8.2) Malfunction Criteria:

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(8.2.4) Catalyzed PM Filter:

(A) NMHC conversion: For ~~2013~~ 2015 and subsequent model year engines~~,~~ ~~for~~ with catalyzed PM filters that convert NMHC emissions~~,~~:

(i) ~~t~~The OBD system shall monitor the catalyst function of the PM filter and detect a malfunction when the NMHC conversion capability decreases to the point that NMHC emissions exceed 2.0 times the applicable standards.

(ii) If no failure or deterioration of the NMHC conversion capability could result in an engine's NMHC emissions exceeding 2.0 times the applicable standards, the OBD system shall detect a malfunction when the system has no detectable amount of NMHC conversion capability.

(iii) Catalyzed PM filters are exempt from ~~NMHC conversion capability~~this monitoring if both of the following criteria are satisfied: (1) no malfunction of the catalyzed PM filter's NMHC conversion capability can cause emissions to ~~(1)~~ increase by 15 percent or more of the applicable ~~full useful life~~ standard as measured from an applicable emission test cycle; ~~or~~ and (2) no malfunction of the catalyzed PM filter's NMHC conversion capability can cause emissions to exceed the applicable ~~full useful life~~ standard as measured from an applicable emission test cycle.

(B) Feedgas generation: For 2016 and subsequent model year engines with catalyzed PM filters used to generate a feedgas constituency to assist SCR systems (e.g., to increase NO_2 concentration upstream of an SCR system), the OBD system shall detect a malfunction when the system is unable to generate the necessary feedgas constituents for proper SCR system operation. Catalyzed PM filters are exempt from ~~feedgas generation~~ this monitoring if both of the following criteria are satisfied: (1) no malfunction of the catalyzed PM filter's feedgas generation ability can cause emissions to ~~(1)~~ increase by 15 percent or more of the applicable ~~full useful life~~ standard as measured from an applicable emission test cycle; ~~or~~ and (2) no malfunction of the catalyzed PM filter's feedgas generation ability can cause emissions to exceed the applicable ~~full useful life~~ standard as measured from an applicable emission test cycle.

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(g) *Monitoring Requirements For All Engines.*

(1) Engine Cooling System Monitoring

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(1.3) Monitoring Conditions:

(1.3.1) Thermostat

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(D) Manufacturers may request Executive Officer approval to suspend or disable thermostat monitoring if the vehicle is subjected to conditions which could lead to false diagnosis (e.g., vehicle operation at idle for more than 50 percent of the warm-up time, ~~hot restart conditions~~ engine block heater operation). ~~In general, the Executive Officer shall not approve disablement of the monitor on engine starts where the ECT at engine start is more than 35 degrees Fahrenheit lower than the thermostat malfunction threshold temperature determined under section (g)(1.2.1)(A). The Executive Officer shall approve the request upon determining that the manufacturer has provided data and/or engineering analysis that demonstrate the need for the request.~~ With respect to disablement on driving cycles solely due to warm ECT at engine start conditions, the manufacturer shall disable the monitor during driving cycles where the ECT at engine start is within 35 degrees Fahrenheit of the thermostat malfunction threshold temperature determined under section (g)(1.2.1)(A) (e.g., if the malfunction threshold temperature is 160 degrees Fahrenheit, the monitor shall be disabled if the ECT at engine start is ~~between~~ above 125 ~~and 160 degrees~~ Fahrenheit).

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(3) Comprehensive Component Monitoring

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(3.2) Malfunction Criteria:

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(3.2.2) Output Components/Systems:

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(F) For ~~2013~~ 2015 and subsequent model year engines that utilize fuel control system components (e.g., injectors, fuel pump) that have tolerance compensation features implemented in hardware or software during production or repair procedures (e.g., individually coded injectors for flow characteristics that are programmed into an electronic control unit to compensate for injector to injector tolerances, fuel pumps that use in-line resistors to correct for differences in fuel pump volume output), the components shall be monitored to ensure the proper compensation is being used.

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(ii) Monitoring of the fuel control system components under section (g)(3.2.2)(F)(i) is not required if the manufacturer demonstrates that both of the following criteria are satisfied: (1) no fault of the

components' tolerance compensation features (e.g., wrong compensation being used) could cause emissions to ~~(1)~~ increase by 15 percent or more of the applicable ~~full useful life~~ standard as measured from an applicable emission test cycle; ~~or~~ and (2) no fault of the components' tolerance compensation features can cause emissions to exceed the applicable ~~full useful life~~ standard as measured from an applicable emission test cycle. For purposes of determining if the emission criteria above are met, the manufacturers shall request Executive Officer approval of the test plan for which the emission impact will be determined. The test plan shall include the combination of failed components and the degree of mismatch (e.g., wrong compensation) used as well as the test procedure and emission test cycles used to demonstrate the emission impact, including the necessary preconditioning cycles used by the system to correct or adapt for any mismatch and mitigate the emission impact. Executive Officer approval shall be granted upon determining that the manufacturer has submitted data and/or engineering analysis that demonstrate that the conditions necessary for the system to correct or adapt will readily occur in a timely manner during in-use operation and that the test conditions represent worst case emissions from typical in-use service actions when considering the distribution and variance of the compensation values and parts (e.g., replacement of one or more plus-one-sigma injectors with minus-one-sigma injectors without updating of the compensation value).

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(5) Exceptions to Monitoring Requirements

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(5.7) ~~A manufacturer may request Executive Officer approval to be exempt from monitoring a component if both of~~ The OBD system is not required to monitor an electronic powertrain component/system if the following criteria are met when the ambient temperature is above 20 degrees Fahrenheit: (1) a malfunction of the component does not affect emissions during any reasonable driving condition, ~~and~~ (2) a malfunction of the component does not affect the diagnostic strategy for any other monitored component or system, ~~.~~ and (3) t~~T~~he ambient temperature ~~shall be~~ is determined based on a temperature sensor monitored by the OBD system (e.g., IAT sensor). The manufacturer shall determine whether a component/system meets these criteria. If the Executive Officer reasonably believes that a manufacturer has incorrectly determined that a component/system meets these criteria, the Executive Officer shall require the manufacturer to provide emission and/or other diagnostic data showing that the component/system, when malfunctioning and installed in a suitable test vehicle, does not have an effect on emissions or other diagnostic strategies. The Executive Officer may request emission data for any reasonable driving condition at ambient temperatures above 20 degrees Fahrenheit. ~~The Executive Officer shall~~

~~approve the request upon determining that the manufacturer has submitted data and/or engineering evaluation that support these criteria.~~

(5.8) Whenever the requirements in section (e) or (f) of this regulation require a manufacturer to meet a specific phase-in schedule, ~~manufacturers may use an alternate phase-in schedule in lieu of the required phase-in schedule if the alternate phase-in schedule provides for equivalent compliance volume as defined in section (c) except as specifically noted for the phase-in for the PM filter monitor in section (e)(8.2.1)~~

(5.8.1) Manufacturers may use an alternate phase-in schedule in lieu of the required phase-in schedule if the alternate phase-in schedule provides for equivalent compliance volume as defined in section (c) except as specifically noted for the phase-in for the PM filter monitor in section (e)(8.2.1).

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(h) *Standardization Requirements.*

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(4) Required Emission Related Functions:
The following standardized functions shall be implemented in accordance with the specifications in SAE J1979 or SAE J1939 to allow for access to the required information by a scan tool meeting SAE J1978 specifications or designed to communicate with an SAE J1939 network:

(4.1) Readiness Status: In accordance with SAE J1979/J1939-73 specifications, the OBD system shall indicate “complete” or “not complete” since the fault memory was last cleared for each of the installed monitored components and systems identified in sections (e)(1) through (f)(9), and (g)(3) except (e)(11) and (f)(4). ~~The readiness status for all components or systems identified in (f)(2) and (g)(3) shall always indicate “complete”. The readiness status for all other components or systems shall immediately indicate “complete” upon the respective monitor(s) (except those monitors specified under section (h)(4.1.4) below) determining that the component or system is not malfunctioning. The readiness status for a component or system shall also indicate “complete” if after the requisite number of decisions necessary for determining MIL status has been fully executed, the monitor indicates a malfunction for the component or system. The readiness status for each of the monitored components or systems shall indicate “not complete” whenever fault memory has been cleared or erased by a means other than that allowed in section (d)(2). Normal vehicle shut down (i.e., key off, engine off) may not cause the readiness status to indicate “not complete”.~~

(4.1.1) ~~Subject to Executive Officer approval, a manufacturer may request that the readiness status for a monitor be set to indicate “complete” without monitoring having been completed if monitoring is disabled for a multiple number of driving cycles due to the continued presence of extreme operating conditions (e.g., cold ambient temperatures, high altitudes). Executive Officer approval shall be based on the conditions for monitoring system disablement and the number of driving cycles specified without~~

~~completion of monitoring before readiness is indicated as "complete".~~ The readiness status for the following component/system readiness bits shall always indicate "complete":

(A) Diesel misfire (section (e)(2)) for engines without a separate monitor designed to detect misfires identified in section (e)(2.2.1) and subject to the monitoring conditions of sections (e)(2.3.1) and (e)(2.3.2)

(~~A~~B) Gasoline misfire (section (f)(2))

(~~B~~C) Diesel and gasoline comprehensive component (section (g)(3))

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(4.1.3) For 2016 and subsequent model year engines, for components and systems not listed in section (h)(4.1.1) above, the readiness status for each component/system readiness bit listed below shall immediately indicate "complete" if any of the following conditions occur: (1) all the respective supported monitors listed below for each component/system have fully executed and determined that the component or system is not malfunctioning, or (2) at least one of the monitors listed below for each component/system has determined that the component or system is malfunctioning after the requisite number of decisions necessary for determining the MIL status have been fully executed, regardless of whether or not the other monitors listed have been fully executed:

(A) Diesel Fuel System: sections (e)(1.2.1), (e)(1.2.2), and (e)(1.2.3)

(B) Diesel Misfire: section (e)(2.2.1) for engines with a separate monitor designed to detect misfires identified in section (e)(2.2.1) and subject to the monitoring conditions of sections (e)(2.3.1) and (e)(2.3.2)

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~~(6) Service Information:~~

~~(6.1) Engine manufacturers shall provide the aftermarket service and repair industry emission-related service information as set forth in sections (h)(6.3) through (6.5).~~

~~(6.2) The Executive Officer shall waive the requirements of sections (h)(6.3) through (6.5) upon determining that ARB or U.S. EPA has adopted a service information regulation or rule that is in effect and operative and requires engine manufacturers to provide emission-related service information:~~

~~(A) of comparable or greater scope than required under these provisions;~~

~~(B) in an easily accessible format and in a timeframe that is equivalent to or exceeds the timeframes set forth below; and~~

~~(C) at fair and reasonable cost.~~

~~(6.3) Manufacturers shall make readily available, at a fair and reasonable price to the automotive repair industry, vehicle repair procedures which allow effective emission-related diagnosis and repairs to be performed using only the SAE J1978/J1939 generic scan tool and commonly available, non-microprocessor based tools.~~

~~(6.4) As an alternative to publishing repair procedures required under section (h)(6.3), a manufacturer may publish repair procedures referencing the use of~~

~~manufacturer-specific or enhanced equipment provided the manufacturer meets one of the following conditions:~~

~~(6.4.1) makes available to the aftermarket scan tool industry the information needed to manufacture scan tools to perform the same emission-related diagnosis and repair procedures (excluding any reprogramming) in a comparable manner as the manufacturer-specific diagnostic scan tool, or~~

~~(6.4.2) makes available for purchase, at a fair and reasonable price to the automotive repair industry, a manufacturer-specific or enhanced tool to perform the emission-related diagnosis and repair procedures (excluding any reprogramming).~~

~~(6.5) Manufacturers shall make available:~~

~~(6.5.1) Information to utilize the test results reported as required in section (h)(4.5). The information must include a description of the test and test result, typical passing and failing values, associated fault codes with the test result, and scaling, units, and conversion factors necessary to convert the results to engineering units.~~

~~(6.5.2) A generic description of each of the diagnostics used to meet the requirements of this regulation. The generic description must include a text description of how the diagnostic is performed, typical enable conditions, typical malfunction thresholds, typical monitoring time, fault codes associated with the diagnostic, and test results (section (h)(4.5)) associated with the diagnostic. Vehicles that have diagnostics not adequately represented by the typical values identified above shall be specifically identified along with the appropriate typical values.~~

~~(6.5.3) Information necessary to execute each of the diagnostics used to meet the requirements of sections (e)(1) through (f)(9). The information must include either a description of sample driving patterns designed to be operated in-use or a written description of the conditions the vehicle needs to operate in to execute each of the diagnostics necessary to change the readiness status from "not complete" to "complete" for all monitors. The information shall be able to be used to exercise all necessary monitors in a single driving cycle as well as be able to be used to exercise the monitors to individually change the readiness status for each specific monitor from "not complete" to "complete".~~

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(i) *Monitoring System Demonstration Requirements for Certification.*

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(3) Required Testing:

Except as provided below, the manufacturer shall perform single-fault testing based on the applicable test with the following components/systems set at their malfunction criteria limits as determined by the manufacturer for meeting the requirements of sections (e), (f), and (g) or sections (d)(7.1.2) and (d)(7.2.3) for extrapolated OBD systems.

(3.1) Required testing for Diesel/Compression Ignition Engines:

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(3.1.2) Misfire Monitoring: ~~For 2010 through 2012 model year engines, a~~ For 2013 model year engines subject to section (e)(2.2.5), the manufacturer shall perform a test at the malfunction limit specified in section (e)(2.2.5). A misfire demonstration test is not required for diesel engines not subject to section (e)(2.2.5). ~~For 2013 and subsequent model year engines, the manufacturer shall perform a test at the malfunction criteria limit specified in section (e)(2.2.2).~~

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(j) *Certification Documentation.*

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(2) The following information shall be submitted as part of the certification application. Except as provided below for demonstration data, the Executive Officer will not issue an Executive Order certifying the covered engines without the information having been provided. The information must include:

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(2.19) A list of the test results required to be made available under section (~~g~~h)(4.5) and the corresponding diagnostic(s) noted by fault code for each test result.

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Amend section 1968.2, title 13, California Code of Regulations, to read as follows:

Note: The amendments that were approved by the Board at the January 26-27, 2012 board hearing are shown in single underline to indicate additions and ~~single strikeout~~ to indicate deletions from the existing regulatory text. These amendments were formally approved by the Office of Administrative Law on August 7, 2012, and became operative on August 7, 2012. The amendments proposed with the 45-day notice are shown in double underline to indicate additions and ~~double strikeout~~ to indicate deletions from the existing regulatory text. New amendments proposed with these staff suggested modifications are shown in ***bold italic double underline*** to indicate additions and ~~***bold italic double strikeout***~~ to indicate deletions from the existing regulatory text. Various portions of the regulations that are not modified by the proposed amendments are omitted from the text shown and indicated by " * * * * * ".

§1968.2. Malfunction and Diagnostic System Requirements -- 2004 and Subsequent Model-Year Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles and Engines

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(e) *Monitoring Requirements for Gasoline/Spark-Ignited Engines.*

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(15) *Comprehensive Component Monitoring*

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(15.4) MIL Illumination and Fault Code Storage:

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(15.4.3) For purposes of determining the emission increase in section (e)(15.4.2)(A), the manufacturer shall request Executive Officer approval of the test cycle/vehicle operating conditions for which the emission increase will be determined. Executive Officer approval shall be granted upon determining that the manufacturer has submitted data and/or engineering evaluation that demonstrate that the testing conditions represent in-use driving conditions where emissions are likely to be most affected by the malfunctioning component. For purposes of determining whether the specified percentages in section (e)(15.4.2)(A) are exceeded, if the approved testing conditions are comprised of an emission test cycle with an ***exhaust*** emission standard, the measured increase shall be compared to a percentage of the ***exhaust*** emission standard (e.g., if the increase is equal to or more than 15 percent of the ***exhaust*** emission standard for that test cycle). If the approved testing conditions are comprised of a test cycle or vehicle operating condition that does not have an ***exhaust*** emission standard, the measured increase shall be calculated as a percentage of the baseline test (e.g., if the increase from a back-to-back test sequence between normal and malfunctioning condition is equal

to or more than 15 percent of the baseline test results from the normal condition).

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(f) *Monitoring Requirements for Diesel/Compression-Ignition Engines.*

(1) *Non-Methane Hydrocarbon (NMHC) Converting Catalyst Monitoring*

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(1.2) Malfunction Criteria:

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(1.2.2) Conversion Efficiency:

(A) The OBD II system shall detect an NMHC catalyst malfunction when the catalyst conversion capability decreases to the point that emissions exceed:

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(ii) For medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard:

a. 2.5 times the applicable NMHC standards for 2007 through 2012 model year vehicles; and

b. 2.0 times the applicable NMHC standards or the applicable NOx standard by more than 0.2 g/bhp-hr (e.g., cause emissions to exceed 0.4 g/bhp-hr if the ***exhaust*** emission standard is 0.2 g/bhp-hr) for 2013 and subsequent model year vehicles.

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(1.2.3) Other Aftertreatment Assistance Functions. Additionally, for 2010 and subsequent model year vehicles, the catalyst(s) shall be monitored for other aftertreatment assistance functions:

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(B) For 201~~0~~5 and subsequent model year passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard and 201~~3~~5 and subsequent model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard, for catalysts used to generate a feedgas constituency to assist SCR systems (e.g., to increase NO_2 concentration upstream of an SCR system), the OBD II system shall detect a malfunction when the catalyst is unable to generate the necessary feedgas constituents for proper SCR system operation. Catalysts are exempt from ***~~feedgas generation~~ this*** monitoring if ***both of the following criteria are satisfied: (1)*** no malfunction of the catalyst's feedgas generation ability can cause emissions to ***~~(1)~~*** increase by 15 percent or more of the applicable full useful life standard as measured from an applicable emission test cycle; ***~~or~~ and*** (2) ***no malfunction of the catalyst's feedgas generation ability can cause emissions to*** exceed the applicable full useful life standard as measured from an applicable emission test cycle.

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(2) *Oxides of Nitrogen (NOx) Converting Catalyst Monitoring*

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(2.2) Malfunction Criteria:

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(2.2.2) Conversion Efficiency:

(A) The OBD II system shall detect a NOx catalyst malfunction when the catalyst conversion capability decreases to the point that NOx or NMHC emissions exceed:

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(ii) For medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard:

a. the applicable NOx standard by more than 0.5 g/bhp-hr (e.g., cause NOx emissions to exceed 0.7 g/bhp-hr if the ***exhaust*** emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test or 3.5 times the applicable NMHC standard for 2007 through 2009 model year vehicles;

b. the applicable NOx standard by more than 0.4 g/bhp-hr (e.g., cause NOx emissions to exceed 0.6 g/bhp-hr if the ***exhaust*** emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test or 2.5 times the applicable NMHC standard for 2010 through 2012 model year vehicles; ~~and~~

c. the applicable NOx standard by more than 0.3 g/bhp-hr (e.g., cause NOx emissions to exceed 0.5 g/bhp-hr if the ***exhaust*** emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test or 2.0 times the applicable NMHC standard for 2013 through 2015 model year vehicles; and

~~c~~d. the applicable NOx standard by more than 0.2 g/bhp-hr (e.g., cause NOx emissions to exceed 0.4 g/bhp-hr if the ***exhaust*** emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test or 2.0 times the applicable NMHC standard for ~~2013~~ 2016 and subsequent model year vehicles.

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(2.3) Monitoring Conditions:

(2.3.1) Manufacturers shall define the monitoring conditions for malfunctions identified in sections (f)(2.2.2)***, (f)(2.2.3)(A),*** and (f)(2.2.3)(C) (i.e., catalyst efficiency, ***reductant delivery performance, and*** improper reductant) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements). For purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in section (f)(2.2.2) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.2).

(2.3.2) Except as provided for in section (f)(2.3.3), the OBD II system shall monitor continuously for malfunctions identified in section***s*** (f)(2.2.3)~~***(A),***~~ (B)~~,~~ and (D) (~~***e.g.***~~***i.e.***, ~~***SCR performance,***~~ insufficient reductant, feedback control).

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(3) *Misfire Monitoring*

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(3.2) Malfunction Criteria:

(3.2.1) The OBD II system shall detect a misfire malfunction when one or more cylinders are continuously misfiring.

(3.2.2) Additionally, for ***all combustion sensor or combustion quality sensor-equipped (e.g., for use in homogeneous charge compression ignition control systems)*** 2010 and subsequent model year ~~vehicles~~ passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard, ***for all combustion sensor or combustion quality sensor-equipped and*** ~~and~~ 2010 through 2015 model year medium-duty vehicles ~~***equipped with sensors that can detect combustion or combustion quality (e.g., for use in homogeneous charge compression ignition (HCCI) control systems)***~~, and for 20 percent of 2016 model year, 50 percent of 2017 model year, and 100 percent of 2018 model year medium-duty vehicles (percentage based on the manufacturer's projected California sales volume for all medium-duty diesel vehicles):

* * * *

(3.3) Monitoring Conditions:

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(3.3.3) ~~Additionally, f~~For misfires identified in section (f)(3.2.2) ~~2010 and subsequent model year vehicles subject to (f)(3.2.2)~~, the OBD II system shall monitor for misfire as follows:

(A) For passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard, ~~T~~the OBD II system shall continuously monitor for misfire under all positive torque engine speeds and load conditions.

(B) For medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard, the OBD II system shall continuously monitor for misfire under the following conditions:

(i) For 2010 through 2018 model year vehicles and 2019 and subsequent model year vehicles that are not included in the phase-in specified in section (f)(3.3.3)(B)(ii), under positive torque conditions ***up to75 percent of peak torque*** with engine speed up to 75 percent of the maximum-rated engine speed ~~***and engine load up to 75 percent maximum-rated load***~~ except within the following range: the engine operating region bound by the positive torque line (i.e., engine load with transmission in neutral) and the two following engine-operating points: engine speed of 50 percent of maximum-rated engine speed with the engine ~~***load***~~ ***torque*** at the positive torque line, and 75 percent of the maximum-rated engine speed with the engine ~~***load***~~ ***torque*** 5 percent above the positive torque line.

(ii) For 20 percent of 2019 model year, 50 percent of 2020 model year, and 100 percent of 2021 model year medium-duty vehicles (percentage based on the manufacturer's projected California sales volume for all medium-duty diesel vehicles), under all positive torque engine speed and load conditions ***except within the following range: the engine operating region bound by the positive torque line (i.e., engine load with transmission in neutral) and the two following engine-operating points: engine speed of 50 percent of maximum-rated engine speed with the engine torque at the positive torque line, and 100 percent of the maximum-rated engine speed with the engine torque 10 percent above the positive torque line***.

* * * *

(D) A manufacturer may request Executive Officer approval to disable misfire monitoring or employ an alternate malfunction criterion when misfire cannot be distinguished from other effects.

(i) Upon determining that the manufacturer has presented documentation that demonstrates the disablement interval or period of use of an alternate malfunction criterion is limited only to that necessary for avoiding false detection, the Executive Officer shall approve the disablement or use of the alternate malfunction criterion for conditions involving:

a. rough road,

b. fuel cut,

c. gear changes for manual transmission vehicles,

d. traction control or other vehicle stability control activation such as anti-lock braking or other engine torque modifications to enhance vehicle stability,

e. off-board control or intrusive activation of vehicle components or diagnostics during service or assembly plant testing,

f. intrusive diagnostics during portions that can significantly affect engine stability, or

g. infrequent regeneration events during portions that can significantly affect engine stability.

* * * *

(4) *Fuel System Monitoring*

* * * *

(4.2) Malfunction Criteria:

(4.2.1) Fuel system pressure control:

(A) The OBD II system shall detect a malfunction of the fuel system pressure control system (e.g., fuel, hydraulic fluid) prior to any failure or deterioration that would cause a vehicle's NMHC, CO, NOx, or PM emissions to exceed:

* * * *

(ii) For medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard:

a. 1.5 times any of the applicable NMHC, CO, and NOx standards or 0.03 g/bhp-hr PM as measured from an applicable cycle emission test for 2007 and subsequent model year vehicles certified to an engine dynamometer tailpipe NOx emission standard of greater than 0.50 g/bhp-hr NOx;
b. 2.5 times any of the applicable NMHC or CO standards, the applicable NOx standard by more than 0.3 g/bhp-hr (e.g., cause NOx emissions to exceed 0.5 g/bhp-hr if the ***exhaust*** emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test, or 0.03 g/bhp-hr PM as measured from an applicable cycle emission test for 2007 through 2012 model year vehicles certified to an engine dynamometer tailpipe NOx emission standard of less than or equal to 0.50 g/bhp-hr NOx; and
c. 2.0 times any of the applicable NMHC or CO standards, the applicable NOx standard by more than 0.2 g/bhp-hr (e.g., cause NOx emissions to exceed 0.4 g/bhp-hr if the ***exhaust*** emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test, or 0.03 g/bhp-hr PM as measured from an applicable cycle emission test for 2013 and subsequent model year vehicles certified to an engine dynamometer tailpipe NOx emission standard of less than or equal to 0.50 g/bhp-hr NOx;

* * * *

(5) *Exhaust Gas Sensor Monitoring*

* * * *

(5.2) Malfunction Criteria:

(5.2.1) Air-Fuel Ratio Sensors:

(A) For sensors located upstream of the exhaust aftertreatment:

(i) Sensor performance faults: The OBD II system shall detect a malfunction prior to any failure or deterioration of the sensor voltage, resistance, impedance, current, response rate, amplitude, offset, or other characteristic(s) that would cause a vehicle's NMHC, CO, NOx, or PM emissions to exceed:

* * * *

b. For medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard:
1. 1.5 times the applicable NMHC, CO, and NOx standards or 0.03 g/bhp-hr PM as measured from an applicable cycle emission test for 2007 and subsequent model year vehicles certified to an engine dynamometer tailpipe NOx emission standard of greater than 0.50 g/bhp-hr NOx;
2. 2.5 times the applicable NMHC or CO standards, the applicable NOx standard by more than 0.3 g/bhp-hr (e.g., cause NOx emissions to exceed 0.5 g/bhp-hr if the ***exhaust*** emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test, or 0.03 g/bhp-hr PM as measured from an

applicable cycle emission test for 2007 through 2012 model year vehicles certified to an engine dynamometer tailpipe NOx emission standard of less than or equal to 0.50 g/bhp-hr NOx; and

3. 2.0 times the applicable NMHC or CO standards, the applicable NOx standard by more than 0.2 g/bhp-hr (e.g., cause NOx emissions to exceed 0.4 g/bhp-hr if the ***exhaust*** emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test, or 0.03 g/bhp-hr PM as measured from an applicable cycle emission test for 2013 and subsequent model year vehicles certified to an engine dynamometer tailpipe NOx emission standard of less than or equal to 0.50 g/bhp-hr NOx.

* * * *

(B) For sensors located downstream of the exhaust aftertreatment:

(i) Sensor performance faults: The OBD II system shall detect a malfunction prior to any failure or deterioration of the sensor voltage, resistance, impedance, current, response rate, amplitude, offset, or other characteristic(s) that would cause a vehicle's NMHC, CO, NOx, or PM emissions to exceed:

* * * *

b. For medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard:

1. 2.5 times the applicable NMHC or CO standards, the applicable NOx standard by more than 0.5 g/bhp-hr (e.g., cause NOx emissions to exceed 0.7 g/bhp-hr if the ***exhaust*** emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test, or 0.05 g/bhp-hr PM as measured from an applicable cycle emission test for 2007 through 2009 model year vehicles certified to an engine dynamometer tailpipe NOx emission standard of greater than 0.50 g/bhp-hr NOx;
2. 2.5 times the applicable NMHC or CO standards, the applicable NOx standard by more than 0.3 g/bhp-hr (e.g., cause NOx emissions to exceed 0.5 g/bhp-hr if the ***exhaust*** emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test, or 0.05 g/bhp-hr PM as measured from an applicable cycle emission test for 2007 through 2012 model year vehicles certified to an engine dynamometer tailpipe NOx emission standard of less than or equal to 0.50 g/bhp-hr NOx; and
3. 2.0 times the applicable NMHC or CO standards, the applicable NOx standard by more than 0.2 g/bhp-hr (e.g., cause NOx emissions to exceed 0.4 g/bhp-hr if the ***exhaust*** emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test, or 0.03 g/bhp-hr PM as measured from an applicable cycle emission test for 2013 and subsequent model

year vehicles certified to an engine dynamometer tailpipe NOx emission standard of less than or equal to 0.50 g/bhp-hr NOx.

* * * *

(5.2.2) NOx and PM sensors:

(A) Sensor performance faults: The OBD II system shall detect a malfunction prior to any failure or deterioration of the sensor voltage, resistance, impedance, current, response rate, amplitude, offset, or other characteristic(s) that would cause a vehicle's emissions to exceed:

* * * *

(ii) For medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard:

a. 2.5 times the applicable NMHC standards, the applicable NOx standard by more than 0.5 g/bhp-hr (e.g., cause NOx emissions to exceed 0.7 g/bhp-hr if the ***exhaust*** emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test or 0.05 g/bhp-hr PM as measured from an applicable cycle emission test for 2007 through 2009 model year vehicles;

b. 2.5 times the applicable NMHC standards, the applicable NOx standard by more than 0.4 g/bhp-hr (e.g., cause NOx emissions to exceed 0.6 g/bhp-hr if the ***exhaust*** emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test or 0.05 g/bhp-hr PM as measured from an applicable cycle emission test for 2010 through 2012 model year vehicles; ~~and~~

c. 2.0 times the applicable NMHC standard, the applicable NOx standard by more than 0.3 g/bhp-hr (e.g., cause NOx emissions to exceed 0.5 g/bhp-hr if the ***exhaust*** emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test, or 0.03 g/bhp-hr PM as measured from an applicable cycle emission test for 2013 through 2015 model year vehicles; and

~~c~~d. 2.0 times the applicable NMHC standards, the applicable NOx standard by more than 0.2 g/bhp-hr (e.g., cause NOx emissions to exceed 0.4 g/bhp-hr if the ***exhaust*** emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test or 0.03 g/bhp-hr PM as measured from an applicable cycle emission test for ~~2013~~ 2016 and subsequent model year vehicles.

* * * *

(5.3) Monitoring Conditions:

(5.3.1) Exhaust Gas Sensors

(A) Manufacturers shall define the monitoring conditions for malfunctions identified in sections (f)(5.2.1)(A)(i), (5.2.1)(B)(i), ~~and~~ (5.2.2)(A), and (5.2.2)(D) (e.g., sensor performance faults) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements). For all 2010 and subsequent model year vehicles, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions

identified in sections (f)(5.2.1)(A)(i), (5.2.1)(B)(i), ~~and~~ (5.2.2)(A), and for 2016 and subsequent model year medium-duty vehicles ~~***certified to an engine dynamometer tailpipe emission standard***~~, section (f)(5.2.2)(D) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.2).

* * * *

(6) *Exhaust Gas Recirculation (EGR) System Monitoring*

* * * *

(6.2) Malfunction Criteria:

(6.2.1) Low Flow:

(A) The OBD II system shall detect a malfunction of the EGR system at or prior to a decrease from the manufacturer's specified EGR flow rate that would cause a vehicle's NMHC, CO, NOx, or PM emissions to exceed:

* * * *

(ii) For medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard:

a. 1.5 times the applicable FTP standards for 2004 through 2006 model year vehicles;

b. 1.5 times the applicable NMHC, CO, and NOx standards or 0.03 g/bhp-hr PM as measured from an applicable cycle emission test for 2007 and subsequent model year vehicles certified to an engine dynamometer tailpipe NOx emission standard of greater than 0.50 g/bhp-hr NOx;

c. 2.5 times the applicable NMHC or CO standards, the applicable NOx standard by more than 0.3 g/bhp-hr (e.g., cause NOx emissions to exceed 0.5 g/bhp-hr if the ***exhaust*** emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test, or 0.03 g/bhp-hr PM as measured from an applicable cycle emission test for 2007 through 2012 model year vehicles certified to an engine dynamometer tailpipe NOx emission standard of less than or equal to 0.50 g/bhp-hr NOx; and

d. 2.0 times the applicable NMHC or CO standards, the applicable NOx standard by more than 0.2 g/bhp-hr (e.g., cause NOx emissions to exceed 0.4 g/bhp-hr if the ***exhaust*** emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test, or 0.03 g/bhp-hr PM as measured from an applicable cycle emission test for 2013 and subsequent model year vehicles certified to an engine dynamometer tailpipe NOx emission standard of less than or equal to 0.50 g/bhp-hr NOx.

* * * *

(6.2.6) EGR Catalyst Performance: For catalysts located in the EGR system ~~***on 2013 and subsequent model year vehicles***~~ and used to convert constituents to reduce emissions or protect or extend the durability of other emission-related components (e.g., to reduce fouling of an EGR cooler or valve)~~,~~:

(A) For 2004 through 2012 model year vehicles, the catalyst shall be monitored in accordance with the other emission control or source system monitoring requirements under section (f)(16).

(B) For 2013 and subsequent model year vehicles, except as provided for in section (f)(6.2.6)(C) below, the OBD II system shall detect a malfunction when the catalyst has no detectable amount of constituent (e.g., hydrocarbons, soluble organic fractions) oxidation. ~~***For 2004 through 2012 model year vehicles, the catalyst shall be monitored in accordance with the other emission control or source system monitoring requirements under section (f)(16).***~~

(C) Monitoring of the catalyst is not required if there is no measurable emission impact on the criteria pollutants (i.e., NMHC, CO, NOx, and PM) during any reasonable driving condition in which the catalyst is most likely to affect criteria pollutants.

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(7) *Boost Pressure Control System Monitoring*

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(7.2) Malfunction Criteria:

(7.2.1) Underboost:

(A) The OBD II system shall detect a malfunction of the boost pressure control system at or prior to a decrease from the manufacturer's commanded or expected boost pressure that would cause a vehicle's NMHC, CO, NOx, or PM emissions to exceed:

* * * *

(ii) For medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard:

a. 2.5 times the applicable NMHC or CO standards, the applicable NOx standard by more than 0.3 g/bhp-hr (e.g., cause NOx emissions to exceed 0.5 g/bhp-hr if the ***exhaust*** emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test, or 0.03 g/bhp-hr PM as measured from an applicable cycle emission test for 2010 through 2012 model year vehicles; and

b. 2.0 times the applicable NMHC or CO standards, the applicable NOx standard by more than 0.2 g/bhp-hr (e.g., cause NOx emissions to exceed 0.4 g/bhp-hr if the ***exhaust*** emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test, or 0.03 g/bhp-hr PM as measured from an applicable cycle emission test for 2013 and subsequent model year vehicles.

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(8) *NOx Adsorber Monitoring*

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(8.2) Malfunction Criteria:

(8.2.1) NOx adsorber capability:

(A) The OBD II system shall detect a NOx adsorber system malfunction when the NOx adsorber system capability decreases to the point that would cause a vehicle's NOx or NMHC emissions to exceed:

* * * *

(ii) For medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard:

a. the applicable NOx standard by more than 0.5 g/bhp-hr (e.g., cause NOx emissions to exceed 0.7 g/bhp-hr if the ***exhaust*** emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test or 3.5 times the applicable NMHC standard for 2007 through 2009 model year vehicles;

b. the applicable NOx standard by more than 0.3 g/bhp-hr (e.g., cause NOx emissions to exceed 0.5 g/bhp-hr if the ***exhaust*** emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test or 2.5 times the applicable NMHC standard for 2010 through 2012 model year vehicles; and

c. the applicable NOx standard by more than 0.2 g/bhp-hr (e.g., cause NOx emissions to exceed 0.4 g/bhp-hr if the ***exhaust*** emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test or 2.0 times the applicable NMHC standard for 2013 and subsequent model year vehicles.

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(9) *Particulate Matter (PM) Filter Monitoring*

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(9.2) Malfunction Criteria:

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(9.2.2) Frequent Regeneration:

(A) For 2010 and subsequent model year vehicles, the OBD II system shall detect a malfunction when PM filter regeneration occurs more frequently than (i.e., occurs more often than) the manufacturer's specified regeneration frequency such that it would cause a vehicle's emissions to exceed:

* * * *

(ii) For medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard:

a. 2.5 times the applicable NMHC standards or the applicable NOx standard by more than 0.3 g/bhp-hr (e.g., cause NOx emissions to exceed 0.5 g/bhp-hr if the ***exhaust*** emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test for 2010 through 2012 model year vehicles; and

b. 2.0 times the applicable NMHC standards or the applicable NOx standard by more than 0.2 g/bhp-hr (e.g., cause NOx emissions to exceed 0.4 g/bhp-hr if the ***exhaust*** emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test for 2013 and subsequent model year vehicles.

* * * *

(9.2.4) ***Catalyzed PM Filter:***

(A) NMHC conversion: For 201~~0~~5 and subsequent model year passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard and 201~~3~~5 and subsequent model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard with catalyzed PM filters that convert NMHC emissions, the OBD II system shall monitor the catalyst function of the PM filter and detect a malfunction when the NMHC conversion capability decreases to the point that NMHC emissions exceed the applicable emission levels specified in section (f)(9.2.2)(A). If no failure or deterioration of the NMHC conversion capability could result in a vehicle's NMHC emissions exceeding these emission levels, the OBD II system shall detect a malfunction when the system has no detectable amount of NMHC conversion capability. PM filters are exempt from ***~~NMHC conversion capability~~ this*** monitoring if ***both of the following criteria are satisfied: (1)*** no malfunction of the PM filter's NMHC conversion capability can cause emissions to ***~~(1)~~*** increase by 15 percent or more of the applicable full useful life standard as measured from an applicable emission test cycle; ***~~or~~ and*** (2) ***no malfunction of the PM filter's NMHC conversion capability can cause emissions to*** exceed the applicable full useful life standard as measured from an applicable emission test cycle.

(B) Feedgas generation: For 2016 and subsequent model year medium-duty vehicles with catalyzed PM filters used to generate a feedgas constituency to assist SCR systems (e.g., to increase NO_2 concentration upstream of an SCR system), the OBD II system shall detect a malfunction when the system is unable to generate the necessary feedgas constituents for proper SCR system operation. Catalyzed PM filters are exempt from this monitoring if both of the following criteria are satisfied: (1) no malfunction of the catalyzed PM filter's feedgas generation ability can cause emissions to increase by 15 percent or more of the applicable full useful life standard as measured from an applicable emission test cycle; and (2) no malfunction of the catalyzed PM filter's feedgas generation ability can cause emissions to exceed the applicable full useful life standard as measured from an applicable emission test cycle.

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(12) *Cold Start Emission Reduction Strategy Monitoring*

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(12.2) Malfunction Criteria: The OBD II system shall, to the extent feasible, detect a malfunction if either of the following occurs:

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(12.2.2) Any failure or deterioration of the cold start emission reduction control strategy that would cause a vehicle's NMHC, CO, NOx, or PM emissions to exceed:

* * * *

(B) For medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard:

(i) 2.0 times the applicable NMHC or CO standards, the applicable NOx standard by more than 0.2 g/bhp-hr (e.g., cause NOx emissions to exceed 0.4 g/bhp-hr if the ***exhaust*** emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test, or 0.03 g/bhp-hr PM as measured from an applicable cycle emission test for 2013 and subsequent model year vehicles.

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(13) *Variable Valve Timing And/Or Control (VVT) System Monitoring*

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(13.2) Malfunction Criteria:

(13.2.1) Target Error: The OBD II system shall detect a malfunction prior to any failure or deterioration in the capability of the VVT system to achieve the commanded valve timing and/or control within a crank angle or lift tolerance that would cause a vehicle's NMHC, CO, NOx, or PM emissions to exceed:

* * * *

(B) For medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard:

(i) 1.5 times the applicable NMHC, CO, and NOx standards or 0.03 g/bhp-hr PM as measured from an applicable cycle emission test for 2006 and subsequent model year vehicles certified to an engine dynamometer tailpipe NOx emission standard of greater than 0.50 g/bhp-hr NOx;

(ii) 2.5 times the applicable NMHC or CO standards, the applicable NOx standard by more than 0.3 g/bhp-hr (e.g., cause NOx emissions to exceed 0.5 g/bhp-hr if the ***exhaust*** emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test, or 0.03 g/bhp-hr PM as measured from an applicable cycle emission test for 2006 through 2012 model year vehicles certified to an engine dynamometer tailpipe NOx emission standard of less than or equal to 0.50 g/bhp-hr NOx; and

(iii) 2.0 times the applicable NMHC or CO standards, the applicable NOx standard by more than 0.2 g/bhp-hr (e.g., cause NOx emissions to exceed 0.4 g/bhp-hr if the ***exhaust*** emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test, or 0.03 g/bhp-hr PM as measured from an applicable cycle emission test for 2013 and subsequent model year vehicles certified to an engine dynamometer

tailpipe NOx emission standard of less than or equal to 0.50 g/bhp-hr NOx.

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(15) *Comprehensive Component Monitoring*

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(15.2) Malfunction Criteria:

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(15.2.2) Output Components/Systems:

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(F) For ~~2013~~2015 and subsequent model year vehicles that utilize fuel control system components (e.g., injectors, fuel pump) that have tolerance compensation features implemented in hardware or software during production or repair procedures (e.g., individually coded injectors for flow characteristics that are programmed into an electronic control unit to compensate for injector to injector tolerances, fuel pumps that use in-line resistors to correct for differences in fuel pump volume output), the components shall be monitored to ensure the proper compensation is being used.

* * * *

(ii) Monitoring of the fuel control system components under section (f)(15.2.2)(F)(i) is not required if the manufacturer demonstrates that ***both of the following criteria are satisfied: (1)*** no fault of the components' tolerance compensation features (e.g., wrong compensation being used) could cause emissions to ~~***(1)***~~ increase by 15 percent or more of the applicable full useful life standard as measured from an applicable emission test cycle; ~~***or***~~ ***and*** (2) ***no fault of the components' tolerance compensation features could cause emissions to*** exceed the applicable full useful life standard as measured from an applicable emission test cycle. For purposes of determining if the emission criteria above are met, the manufacturers shall request Executive Officer approval of the test plan for which the emission impact will be determined. The test plan shall include the combination of failed components and the degree of mismatch (e.g., wrong compensation) used as well as the test procedure and emission test cycles used to demonstrate the emission impact, including the necessary preconditioning cycles used by the system to correct or adapt for any mismatch and mitigate the emission impact. Executive Officer approval shall be granted upon determining that the manufacturer has submitted data and/or engineering analysis that demonstrate that the conditions necessary for the system to correct or adapt will readily occur in a timely manner during in-use operation and that the test conditions represent worst case emissions from typical in-use service actions when considering the distribution and variance of the compensation values and parts (e.g., replacement of one or more

plus-one-sigma injectors with minus-one-sigma injectors without updating of the compensation value).

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(15.4) MIL Illumination and Fault Code Storage:

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(15.4.3) For purposes of determining the emission increase in section (f)(15.4.2)(A), the manufacturer shall request Executive Officer approval of the test cycle/vehicle operating conditions for which the emission increase will be determined. Executive Officer approval shall be granted upon determining that the manufacturer has submitted data and/or engineering evaluation that demonstrate that the testing conditions represent in-use driving conditions where emissions are likely to be most affected by the malfunctioning component. For purposes of determining whether the specified percentages in section (f)(15.4.2)(A) are exceeded, if the approved testing conditions are comprised of an emission test cycle with an ***exhaust*** emission standard, the measured increase shall be compared to a percentage of the ***exhaust*** emission standard (e.g., if the increase is equal to or more than 15 percent of the ***exhaust*** emission standard for that test cycle). If the approved testing conditions are comprised of a test cycle or vehicle operating condition that does not have an ***exhaust*** emission standard, the measured increase shall be calculated as a percentage of the baseline test (e.g., if the increase from a back-to-back test sequence between normal and malfunctioning condition is equal to or more than 15 percent of the baseline test results from the normal condition).

* * * *

(17) *Exceptions to Monitoring Requirements*

(17.1) Except as provided in sections (f)(17.1.1) through (17.1.4) below, upon request of a manufacturer or upon the best engineering judgment of ARB, the Executive Officer may revise the emission threshold for a malfunction on any diagnostic required in section (f) for medium-duty vehicles if the most reliable monitoring method developed requires a higher threshold to prevent ~~significant errors of commission in detecting~~ false indications of a malfunction. Additionally, except as specified in section (f)(9.2.1)(A)(iii), for 2007 through ~~2009~~2013 model year light-duty vehicles and 2007 through ~~2012~~ ~~2013~~ 2015 model year medium-duty vehicles, the Executive Officer may revise the PM filter malfunction criteria of section (f)(9.2.1) to exclude detection of specific failure modes (e.g., combined failure of partially melted and partially cracked substrates) if the most reliable monitoring method developed requires the exclusion of specific failure modes to prevent ~~significant errors of commission in detecting~~ false indications of a malfunction.

* * * *

(17.1.3) For medium-duty diesel vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard, the Executive Officer shall approve a malfunction criteria of “the applicable PM standard plus 0.02

g/bhp-hr PM (e.g., unable to maintain PM emissions at or below 0.03 g/bhp-hr if the ***exhaust*** emission standard is 0.01 g/bhp-hr) as measured from an applicable cycle emission test" in lieu of "0.03 g/bhp-hr PM as measured from an applicable cycle emission test" wherever required in section (f). The Executive Officer shall also approve a malfunction criteria of "the applicable PM standard plus 0.04 g/bhp-hr PM (e.g., unable to maintain PM emissions at or below 0.05 g/bhp-hr if the ***exhaust*** emission standard is 0.01 g/bhp-hr) as measured from an applicable cycle emission test" in lieu of "0.05 g/bhp-hr PM as measured from an applicable cycle emission test" wherever required in section (f).

* * * *

(h) *Monitoring System Demonstration Requirements For Certification*

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(4) *Required Testing for Diesel/Compression-ignition vehicles:*
Except as provided below, the manufacturer shall perform single-fault testing based on the applicable test with the following components/systems set at their malfunction criteria limits as determined by the manufacturer for meeting the requirements of section (f).

* * * *

(4.3) Misfire Monitoring: For 2010 and subsequent model year vehicles subject to section (f)(3.2.2)(A)(i) ***or (f)(3.2.5)***, the manufacturer shall perform a test at the malfunction criteria limit specified in section (f)(3.2.2)***(A)(i) or (f)(3.2.5)***. A misfire monitor demonstration test is not required for vehicles not subject to section (f)(3.2.2)(A)(i) ***and not subject to section (f)(3.2.5)***.

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